## SECTION C

**COOLING SYSTEM**

**SERIES BN4**

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Section C.1 DESCRIPTION

The circulation of the cooling water is effected by a centrifugal pump mounted in front of the cylinder block and driven by a belt from the crankshaft pulley. A thermostat is fitted in the water outlet pipe at the front end of the engine.

When filling or topping-up the radiator, do so when the engine is cold, and if possible use rain water or clean soft water. Fill up to the filler plug orifice.

The capacity of the system is given in "General Data".

Fig. C1. Showing the radiator filler with its cap removed.

Section C.2 ADJUSTMENTS IN VEHICLE

Overheating may be caused by a slack fan belt, excessive carbon deposit in the cylinders, running with the ignition too far retarded, improper carburettor adjustment, a partially choked radiator causing failure of the water to circulate, or loss of water due to leakage or evaporation.

The belt should be just sufficiently tight to prevent slip, yet it should be possible to move it laterally about 1 in. (2.54 cm.). To make an adjustment, slacken the bolts 1 and 4, fig. C2, which hold the dynamo in position, then raise or lower the dynamo until the desired tension of the belt is obtained. Securely lock the dynamo in position again at securing points 1 and 4, fig. C2, when the adjustment has been made. It must be understood that there is a correct and incorrect method of fitting fan blades. The blades are not flat, but shaped, and the concave or hollow side should be the leading one, thus, when fitting to an engine the convex or arched side must always face the radiator. This convex side is further easily identified as stiffeners are pressed into the blades; they project on the concave face.

Section C.3 RADIATOR

To Remove

1. Drain the cooling system.
2. Slacken the hose clip, on the upper water hose, at the thermostat housing and with the aid of a screwdriver ease the pipe off the housing extension.
3. Take off the radiator bottom hose by releasing the clips on the water pump and the heater outlet pipe.
4. Disconnect the thermometer element from the radiator header tank.
5. Take off the six nuts (three on each side) which secure the radiator to the mounting flanges and remove the radiator.
6. Inspect the radiator core for damage and test it for water leaks. Solder at the points where leakage occurs or renew the core if necessary.
7. Inspect the flexible mountings for wear.
8. Inspect the drain tap for leaks and renew if necessary.
9. Test the filler cap.
10. Inspect the hose connections for deterioration and renew them if necessary.

Fig. C2. Fan belt adjustment. 1 and 2. Dynamo securing bolts. 3. Swinging link. 4. Locknut.
C

COOLING SYSTEM

Section C.4

THERMOSTAT

To Remove

1. Drain the cooling system (see Section C.7).
2. Disconnect the water outlet hose from the outlet elbow.
3. Remove the two nuts securing the outlet elbow to the cylinder head and lift off the outlet elbow.
4. Remove the outlet elbow to cylinder head joint.
5. Lift out the thermostat, fig. C.3.
6. Test the thermostat opening temperature by immersing it in water at a temperature between 158° and 167°F (70° and 75°C). If the thermostat valve does not start to open, or the valve sticks in the fully open position, the thermostat should be renewed. No attempt should be made to repair the thermostat.
7. Clean the joint faces at the outlet elbow and at the housing in the cylinder head.

To Replace

The installation of the thermostat is a reversal of the procedure "To remove". Fit a new joint gasket between the outlet elbow and the cylinder head. In an emergency, the engine can be run with the thermostat removed.

Section C.5

TEMPERATURE GAUGE

A temperature gauge unit, consisting of a thermal element and dial indicator is fitted to the vehicle. The thermal element is held in the radiator header tank by a gland nut. On later engines the thermal capillary is fitted to the engine. (Fig. C.3). The dial indicator is situated in the instrument panel and is connected to the element by a capillary tube filled with mercury.

Damage to any of the above mentioned parts will necessitate the renewal of the complete temperature gauge unit.

Section C.6

FAN AND PUMP ASSEMBLY

To Remove

1. Remove the radiator (see Section C.3).
2. Remove the dynamo (see Section N).
3. Unscrew the four set bolts securing the water pump to the crankcase. Withdraw the fan and pump assembly and remove the fan belt.

To Dismantle

1. Remove the four set bolts and withdraw the fan blades from the pulley.
2. Remove the nut and washers from the pump spindle and withdraw the pulley and hub which is keyed to the spindle.
3. Remove the key and tap the spindle rearwards, complete with the impeller.
4. Remove the front bearing circlip and withdraw the dished grease retainer.
5. Remove the rubber water seal assembly and its distance-piece from the rear of the housing.
6. Drift out the front bearing using Tool No. 18G 61; the bearing distance-piece will follow.
7. To remove the rear bearing, pace the dummy bearing of Tool No. 18G 61 in the pump body, and the drift, which is piloted in the rear bearing, is screwed into it. Tap the complete assembly out through the housing of the front bearing.
8. Withdraw the felt grease seal and retainer.
9. Clean all the dismantled pump parts.
10. Inspect the spindle for wear.
11. Inspect the seals for damage and wear. It is advisable to install new seals whenever the pump has been dismantled.
12. Inspect the bearings for pits and scores. They should be renewed if evidence of excessive wear is detected. Coat the bearings with engine oil and wrap them in a clean cloth or paper until required for reassembly.

Fig. C.3. Illustrating the removal of the thermostat from its housing
1. Thermostat.
2. Joint washer.
3. Temperature gauge connection.
4. Thermostat housing.
(13) If the bearings do not fit properly on the pump spindle or in the body, renew the parts as required.

(14) Inspect the fan belt for uneven wear or frayed fabric, and renew the belt if required.

**To Reassemble**

Reassembly of the fan and pump is a reversal of the procedure "To dismantle". Particular note should be made of the following:

1. Pack the bearings with the recommended grade of grease during assembly.
2. To install the bearings, assemble Tool No. 18G 61, and drive the rear bearing into its housing. The front bearing and distance piece are fitted in a similar manner.
3. Refit the fan blades to the pulley with the radiused tips of the blades leading.
4. Check to see that the bearings run freely without excessive end play, by spinning the fan.

**To Replace**

The installation of the fan and pump assembly is a reversal of the procedure "To remove". Particular note should be made of the following:

1. Install a new joint gasket between the pump body and the cylinder block.
2. Adjust the fan belt (see Section C.2).
3. Lubricate the pump as detailed on page Q.6.

**Section C.7**

**DRAINING AND FLUSHING THE SYSTEM**

**To Drain the System**

When the vehicle is to be stored, the entire cooling system should be drained to protect against corrosion and, in certain instances, freezing. To drain the system proceed as follows:

1. With the vehicle standing on level ground, remove the radiator filler cap.
Caution.—As the system is pressurised, do not remove the radiator filler cap while the engine is running and always wait until the water has cooled.
If it is necessary to remove the filler cap while the engine is hot it is essential to remove it gradually, and the filler neck is provided with a shaped cam to enable this to be done.
Unscrew the cap slowly until the retaining tongues are felt to engage the small lobes at the end of the filler neck cam, and wait until the pressure in the radiator is fully released before finally removing the cap.

(4) To prevent the possibility of operating the vehicle with the system drained, make sure that a suitable notice is placed on the vehicle, or other suitable precautions taken.

To Flush the System
If no inhibitor is used, the cooling system should be drained, cleaned and flushed at intervals depending upon the type of vehicle operation and the local water conditions. Do not use strong caustic or acid solutions for cleaning purposes because they have a detrimental effect on various parts of the system. To clean and flush the system, proceed as follows:

(1) Drain the system completely as described above.
(2) With a hose pipe, or fresh quantities of clean water, flush the system through until water issuing from the drain taps appears to be clean.

Fig. C.6. Showing the radiator drain tap A in the open position. Turn the tap lever down to close.

Fig. C.7. Showing the cylinder block drain tap B:—
1. Closed position. 2. Open position.
(3) Allow the system to drain completely, then close the drain taps.

(4) Fill the system with clean water (or anti-freeze solution), slowly, to allow air to escape past the thermostat valve, up to the bottom of the filler neck.

(5) Replace the filler cap by turning it approximately 90° in a clockwise direction.

Section C.8

FROST PRECAUTIONS

Care should be taken to see that the water is drained off completely, for in case of freezing it will do harm by expansion taking place, and fracture of the cylinder block may result. There are two drain taps, one of them on the right-hand side of the cylinder block, and the other at the base of the radiator. Both taps must be opened to drain the system and the vehicle must be on level ground while draining.

Freezing may occur first at the bottom of the radiator or in the lower hose connection. Ice in the hose will stop water circulation, and may cause boiling.

A muff can be used to advantage, but care must be taken not to run with the muff fully closed, or boiling will result.

If a heater is fitted to the car do not resort to draining the cooling system as an alternative to the use of anti-freeze. It is not possible to drain the heater unit completely by means of the cooling system drain taps.

Protection by Use of Anti-Freeze Mixture

When frost is expected or when the vehicle is to be used in very low temperatures, make sure that the strength of the solution is, in fact, up to the strength recommended on General Information page 9 for the conditions likely to be encountered.

Only anti-freeze solutions of the ethylene glycol type are suitable for use in the cooling system: Bluecol or any anti-freeze to B.S. 3151/2 is recommended.

The specific gravity should be checked from time to time and additional anti-freeze added to ensure adequate protection against frost.

After the second winter it is recommended that the system be drained and refilled with fresh water and the appropriate quantity of antifreeze added when required.

The strength of the solution must be maintained by topping-up with anti-freeze solution as necessary. Excessive topping-up with water will reduce the degree of protection afforded.

If the cooling system has to be emptied, run the mixture into a clean container and use it again.

The correct quantities of anti-freeze are:-

<table>
<thead>
<tr>
<th>Anti-freeze</th>
<th>Commences to freeze</th>
<th>Frozen solid</th>
<th>Amount of antifreeze</th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
<td>°C</td>
<td>°F</td>
<td>Pts.</td>
</tr>
<tr>
<td>25</td>
<td>-13</td>
<td>-9</td>
<td>6</td>
</tr>
<tr>
<td>331</td>
<td>-36</td>
<td>-33</td>
<td>10</td>
</tr>
<tr>
<td>50</td>
<td>-36</td>
<td>-33</td>
<td>10</td>
</tr>
</tbody>
</table>

Section C.9

MODIFIED THERMOSTAT AND FILLER CAP

Commencing at engine no. 3099 a new thermostat (Part No. 11K399) having an opening temperature of 68°C. (154°F.) has been introduced to suit the 7 lb. pressure radiator filler cap, and to reduce the average running temperature of the engine.
SECTION CC

COOLING SYSTEM

SERIES BN6

NOTE

For details of the cooling system of BN6 car refer to Section C.
SECTION CCC

COOLING SYSTEM

Mk. I and II (SERIES BN7 and BI7)
AND Mk. II and III (SERIES BJ7 and BJ8)

Section No. CCC.1  Modified water pump
Section No. CCC.2  Modified thermostat
Section No. CCC.3  Frost precautions

NOTE
For all other repair and service procedures see Section C.
Section CCC.1

MODIFIED WATER PUMP

Later 3000 Mk. II engines are fitted with a modified water pump having a one-piece bearing and spindle. The fan pulley is an interference press fit on the spindle, instead of being keyed and secured by a nut and washers as previously. This pump was introduced at Eng. No. 29E-H-2246.

Dismantling

Remove the fan pulley with a suitable extractor.

Pull out the bearing locating wire through the hole in the pump body.

Gently tap the pump bearing assembly rearwards out of the pump body. This will release the combined bearing and spindle assembly, together with the seal and vane.

Remove the vane from the bearing assembly with a suitable extractor and remove the pump seal assembly.

Reassembling

Reassembly is a reversal of the dismantling procedure, but care must be taken to see that the seal assembly is in good condition. If there is any sign of damage the seal must be renewed. When the bearing assembly is fitted into the pump, the hole (A) in the bearing must coincide with the lubricating hole in the pump body, and a clearance of .020 to .030 in. (5 to 8 mm.) must be maintained between the vane and the pump body (see Fig. CCC.1.)

As the interference fit of the fan pulley on the spindle will have been impaired when dismantling, a new pulley must always be fitted and pressed home until its recessed face (B) is flush with the end of the spindle.

Section CCC.2

MODIFIED THERMOSTAT

A non-bellows wax element type of thermostat, interchangeable with the bellows type used previously, was fitted from Engine No. 29F/2392 to improve the effectiveness of the car heating equipment. The crack-open temperature is given in 'GENERAL DATA'.

When refitting this type of thermostat it is essential that the threaded stem of the unit faces upwards.

Section CCC.3

FROST PRECAUTIONS

The correct quantities of anti-freeze are:

<table>
<thead>
<tr>
<th>Anti-freeze</th>
<th>Commences to freeze</th>
<th>Frozen solid</th>
<th>Amount of anti-freeze</th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
<td>°C</td>
<td>°F</td>
<td>°C</td>
</tr>
<tr>
<td>25</td>
<td>-13</td>
<td>9</td>
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</tr>
<tr>
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<td>-2</td>
<td>-36</td>
</tr>
<tr>
<td>50</td>
<td>-26</td>
<td>-33</td>
<td>-45</td>
</tr>
</tbody>
</table>

Fig. CCC.1. A section through the water pump showing the components. When assembled, the hole in the bearing (A) must coincide with the lubricating hole in the pump body and there must be a clearance of .020 to .030 in. (5 to 8 mm.) between the vane and the pump body. The recessed face of the hub (B) must be flush with the end of the spindle.